Hydrological Summary for Great Britain

FEBRUARY 1997

Rainfall

In stark contrast to January, mild, wet and, on occasions, very boisterous conditions characterised February. A major change in synoptic patterns coinciding with the end of January produced rainfall (and other) statistics for successive months which heavily underline the capricious nature of the British climate. Provisional data suggest that Britain's driest January on record was followed by the third wettest February in a series from 1869; the February rainfall exceeded that for January by an unprecedented margin - some local differentials were extraordinary (eg Plynlimon: 453 mm, Burnbanks in the Lake District: 614 mm). Rainfall exceeded four times the February average in parts of north-western Britain and most regions registered more than 150% of average. However, percentage rainfall totals generally declined away from the western hills and a few, mostly coastal, districts in eastern England reported marginally below average rainfall. North-western England aside, the lower rainfall percentages for February broadly coincided with those regions with the largest long term deficiencies. Notwithstanding the wet February, E&W registered its third lowest winter (Dec.-Feb.) rainfall total since 1964 and many catchments in southern Britain recorded less than 60% of the 1961-90 average. Long-term rainfall deficiencies remain large. The E&W total for the period since March 1995 is the lowest (in that timeframe) in a 230-year record and rainfall deficiencies are still outstanding over much of England.

River Flow

The meteorological transformation in February was strongly reflected in river flow patterns throughout western and northern Britain. Flows increased briskly early in the month and flooding was reported (eg in the Lake District) with, mostly modest, spates at intervals thereafter. Exceptionally depressed runoff rates were superseded by notably high February flows. A new peak monthly flow rate was established on the Tweed (at Boleside) and February runoff totals were close to the highest on record across much of Wales and northern Britain - unprecedented for the River Lune and Welsh Dee (at New Inn). Notably low early February flows were also reported for lowland rivers - new monthly minimum gauged daily flows being established on the Trent, Severn and Thames. A recovery gathered momentum thereafter. Folkore's 'February fill dyke' was vindicated in much of the lowlands but monthly runoff totals were generally well below average and, with groundwater contributions still depressed, the flow recoveries will be short-lived in the absence of further significant spring rainfall. Throughout much of Britain long-term runoff totals remain notably low - in central regions especially. Notwithstanding the February upturn, 24-month accumulations for the Trent, Dove and Soar are the lowest on record (for *any* start month). In the 18-24 month timeframes runoff totals are depressed throughout most of Britain.

Groundwater

Following the exceptional low recharge in January, significant infiltration recommenced in February and increases in levels were rapid in fissured northern and western aquifers eg the Carboniferous and Oolitic limestones - at Ampney Crucis levels rebounded from a January minimum to approach the February maximum. Significant increases - generated from a very low base - were also reported for outcrops of the Permo-Triassic sandstones, but February levels generally remained amongst the lowest on record. Some healthy level increases occurred in the Chalk of Sussex, Hampshire and Dorset but recoveries were barely discernible in some central and eastern outcrops - where rainfall totals were more moderate and modest soil moisture deficits persisted throughout much of the month. Infiltration rates were spatially very variable and, as yet, are not fully reflected in the hydrograph traces for some Chalk index wells - particularly the deeper ones where water-table response may lag by many weeks. Away from the more westerly Chalk outcrops February groundwater levels were close to seasonal minima over wide areas - in the recent past comparably depressed late-winter groundwater resources have been restricted to 1976 and 1992. With evaporation rates increasing, the degree to which the recharge season can be extended through the spring will, in large part, determine the scope of the groundwater stress over the coming summer.

General

The drought eased considerably in February but two-year rainfall totals remain very low. Healthy inflows to most reservoirs reversed the January decline in overall stocks and notable recoveries were reported for many western impoundments. By early March, overall stocks were very close to the seasonal average but stocks are still relatively low in parts of eastern and southern England. Late winter rainfall has produced a significant improvement in the surface water outlook but, over large areas, the groundwater prospects remain fragile - particularly in regions where it is the principal supply source.

Institute of Hydrology

British Geological Survey

This report was compiled jointly by the Institute of Hydrology (a component of the Centre for Ecology and Hydrology) and the British Geological Survey - both organisations form part of the Natural Environment Research Council (NERC).

Data for this report have been provided principally by the regional divisions of the newly formed Environment Agency (England and Wales) and the Scottish Environment Protection Agency. For reasons of consistency and to provide greater spatial discrimination, the original regional divisions of the precursor organisations have been retained for use in the Hydrological Summaries. The majority of the areal rainfall figures have been provided by the Meteorological Office. The most recent areal rainfall figures are derived from a restricted network of raingauges and a proportion of the river flow data is of a provisional nature. Figure 3 is based on weather data collected by the Institute of Hydrology at Wallingford, Balquhidder (Central Region, Scotland) and Plynlimon. Reservoir contents information has been supplied by the Water Services Companies, the Environment Agency and, in Scotland, West of Scotland Water Authority and East of Scotland Water. A map (Figure 4) is provided to assist in the location of the principal monitoring sites.

Financial support towards the production of the Hydrological Summaries is given by the Department of the Environment, the Environment Agency, the Scottish Environment Protection Agency and the Office of Water Services (OFWAT).

The Hydrological Summaries are available on annual subscription at a current cost of £48 per year - enquiries should be directed to the National Water Archive Office at the address below. No charge is made to those organisations providing data for the Summaries. The text of the monthly report, together with details of other National Water Archive facilities, is available on the World Wide Web: http://www.nwl.ac.uk:80/~nrfadata/nwa.html

MORECS

Most of the recent monthly regional rainfall data featured in the Hydrological Summaries are MORECS assessments. MORECS is the generic name for The Meteorological Office services involving the calculation of evaporation and soil moisture routinely for Great Britain. Products include a weekly issue of maps and tables of potential and actual evaporation, soil moisture deficits, effective rainfall and the hydrometeorological variables used to calculate them. The data are used to provide values for 40 km squares - or larger areas - and various sets of maps and tables are available according to user requirements. Options include a day-by-day retrospective calculation of soil moisture at any of 4000 raingauge sites.

Further information about MORECS services may be obtained from: The Meteorological Office, Sutton House, London Road, Bracknell, RG12 2SY

Tel: 01344 856858 Fax: 01344 854024

Institute of Hydrology/British Geological Survey
Maclean Building
Crowmarsh Gifford
Wallingford
Oxfordshire
OX10 8BB

12 March 1997

TABLE 1 1996/97 RAINFALL AS A PERCENTAGE OF THE 1961-90 AVERAGE

		Feb 1996	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan 1997	Feb
England and Wales	mm	83	43	51	57	30	41	79	32	89	126	52	16	100*
	%	132	60	85	89	46	66	104	42	105	140	55	18	159
North West	mm	105	36	77	62	49	65	84	52	149	133	64	11	203
	%	135	38	108	83	60	76	79	45	116	108	52	9	260
Northumbrian	mm	89	31	63	53	22	53	76	30	68	108	84	18	109
	%	151	44	113	85	37	82	94	41	89	126	104	22	184
Severn Trent	mm	67	41	50	48	30	33	68	20	71	95	53	13	80
	%	124	67	91	81	51	62	101	31	111	134	69	18	148
Yorkshire	mm	78	31	41	52	35	41	74	31	57	112	93	15	97
	%	134	46	69	87	58	69	100	46	78	140	112	18	167
Anglian	mm	50	20	15	23	18	40	75	16	46	91	42	12	43
	%	135	43	33	48	35	82	136	33	90	157	76	24	116
Thames	mm	64	35	36	35	16	39	60	20	47	106	24	11	70
	%	142	63	72	63	29	80	103	34	76	163	34	17	155
Southern	mm	68	40	23	51	16	34	78	33	57	147	31	15	88
	%	126	63	43	94	30	71	137	48	71	173	38	19	164
Wessex	mm	85	68	58	60	29	27	86	31	83	145	31	13	107
	%	131	97	109	98	51	52	130	43	105	175	33	14	165
South West	mm	119	72	79	100	34	31	97	49	134	201	52	21	137
	%	118	73	114	139	49	45	115	53	116	161	37	15	135
Welsh	mm	127	73	87	106	47	47	100	58	173	171	52	13	179
	%	131	68	109	129	59	61	99	50	126	120	34	9	185
Scotland	mm	141	60	108	78	65	78	69	62	229	188	95	61	251
	%	138	48	142	91	76	83	59	44	147	125	63	40	246
Highland	mm	152	55	111	84	79	91	78	80	266	250	106	94	303
	%	120	34	122	91	81	86	61	47	134	123	54	50	239
North East	mm	114	59	63	67	33	66	64	32	139	110	86	25	116
	%	175	76	105	97	50	90	74	37	143	111	92	25	178
Tay	mm	116	76	103	67	44	53	64	50	195	142	70	45	242
	%	122	70	166	81	60	69	68	44	150	117	55	31	255
Forth	mm	86	53	86	68	44	55	62	46	186	139	81	43	213
	%	109	56	146	92	64	73	66	42	162	124	74	36	270
Tweed	mm	103	30	79	63	30	53	64	29	134	139	118	26	167
	%	154	38	139	89	46	73	73	33	141	149	127	26	249
Solway	mm	160	74	133	80	78	69	68	56	265	155	99	33	288
	%	158	63	173	94	93	77	57	39	169	108	67	21	285
Clyde	mm	180	62	142	90	88	99	65	79	282	215	93	74	292
	%	153	42	169	99	95	91	49	44	146	119	52	39	247

Note: The monthly regional rainfall figures for England and Wales for January & February 1997 correspond to the MORECS areal assessments derived by the Meteorological Office. In northern England these initial assessments may have a particularly wide error band associated with them, especially when snow is a significant component in the precipitation total. The figures for the Scottish regions (and also for Scotland) for January & February 1997 were derived by IH in collaboration with the SEPA regions.
The provisional figures for England and Wales and for Scotland are derived using a different raingauge network. Regional areal rainfall figures are regularly updated (normally one or two months in arrears) using figures derived from a far denser raingauge network.

* The areal rainfall for England & Wales for February 1997 was estimated from the regional rainfall figures.

TABLE 2 RAINFALL ACCUMULATIONS AND RETURN PERIOD ESTIMATES

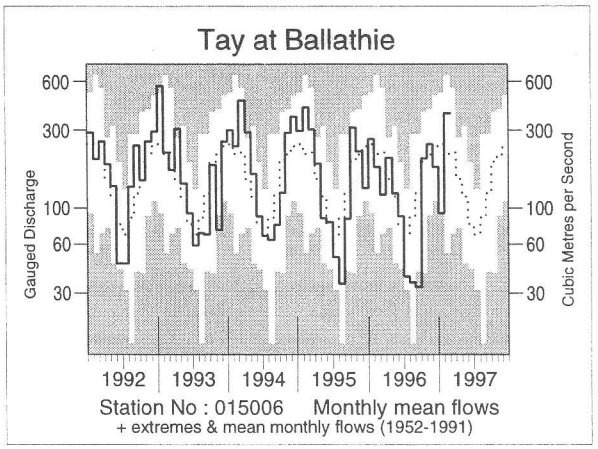
		Dec 96-Feb 97		Sep 96-Feb 97		Mar 96-Feb 97		Apr 95-Feb 97	
			Est Return Period, years		Est Return Period, years		Est Return Period, years		Est Return Period, years
England and Wales	mm	168		415		716		1349	
	% LTA	68	5-15	83	5-10	80	10-20	78	70-100
North West	mm	278		612		985		1678	
	% LTA	86	2-5	89	2-5	82	5-15	73	>200
Northumbria	mm	211		417		715		1377	
	% LTA	94	2-5	91	2-5	84	5-15	84	10-20
Severn Trent	mm	146		332		602		1118	
	% LTA	72	5-10	83	2-5	80	10-15	77	50-80
Yorkshire	mm	204		404		678		1194	
	% LTA	93	2-5	92	2-5	83	5-15	76	80-120
Anglian	mm	97		250		441		855	
	% LTA	68	5-10	83	2-5	74	25-40	75	80-120
Thames	mm	105		278		499		1030	
	% LTA	58	10-20	76	5-10	72	25-40	78	35-50
Southern	mm	135		372		614		1179	
	% LTA	62	5-15	83	2-5	79	10-15	79	30-45
Wessex	mm	151		410		738		1477	
	% LTA	62	5-15	86	2-5	88	2-5	92	2-5
South West	mm	210		594		1007		1969	
	% LTA	55	15-25	83	2-5	86	5-10	88	5-10
Welsh	mm	244		646		1106		2035	
	% LTA	62	10-20	82	5-10	84	5-10	81	30-50
Scotland	mm	406		885		1343		2494	
	% LTA	101	2-5	104	2-5	94	2-5	91	5-15
Highland	mm	503		1099		1597		2891	
	% LTA	98	2-5	101	2-5	91	2-5	86	15-25
North East	mm	227		508		860		1886	
	% LTA	88	2-5	94	2-5	88	5-10	101	2-5
Tay	mm	357		744		1151		2243	
	% LTA	98	2-5	102	2-5	94	2-5	95	2-5
Forth	mm	337		708		1076		1941	
	% LTA	110	2-5	110	2-5	97	2-5	91	5-10
Tweed	mm	311		613		932		1723	
	% LTA	120	2-5	114	2-5	96	2-5	93	2-5
Solway	mm	420		896		1398		2479	
	% LTA	104	2-5	106	2-5	98	2-5	91	5-10
Clyde	mm	459		1035		1581		2866	
	% LTA	94	2-5	100	<2	93	2-5	88	5-15

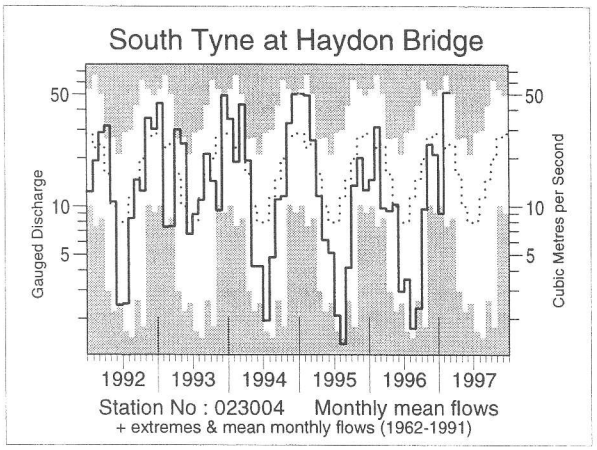
LTA refers to the period 1961-90.

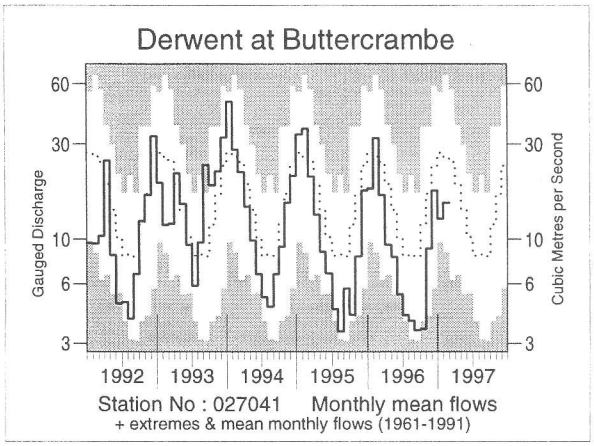
Return period assessments are based on tables provided by the Meteorological Office*. The tables reflect rainfall totals over the period 1911-70 only and the estimate assumes a sensibly stable climate. They assume a start in a specified month; return periods for a start in any month may be expected to be an order of magnitude less - for the longest durations the return period estimates converge. "Wet" return periods underlined. The ranking of accumulated rainfall totals for England & Wales and for Scotland can be affected by artifacts in the historical series - on balance these tend to exaggerate the relative wetness of the recent past.

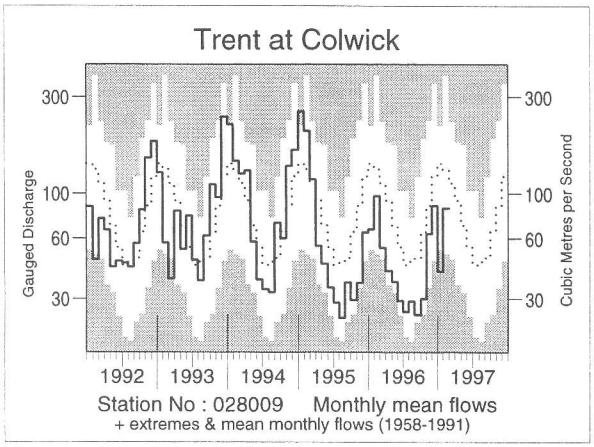
* Tabony, R.C., 1977, The Variability of long duration rainfall over Great Britain, Scientific Paper No. 37, Meteorological Office.

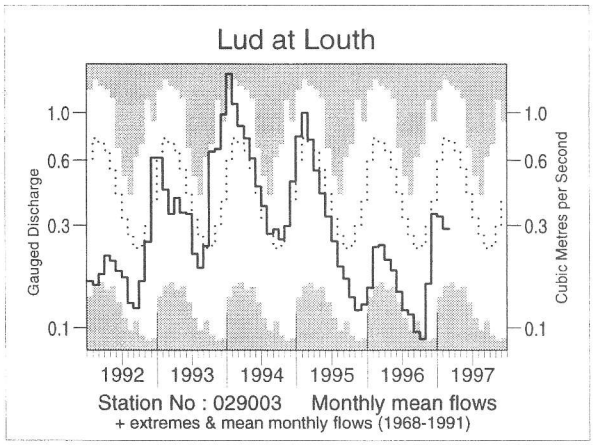
FIGURE 1 MONTHLY RIVER FLOW HYDROGRAPHS

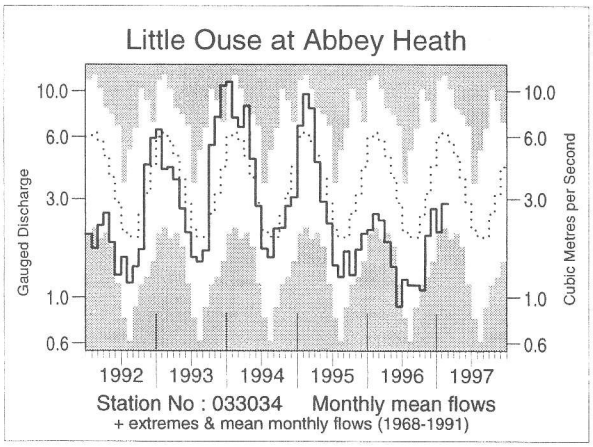


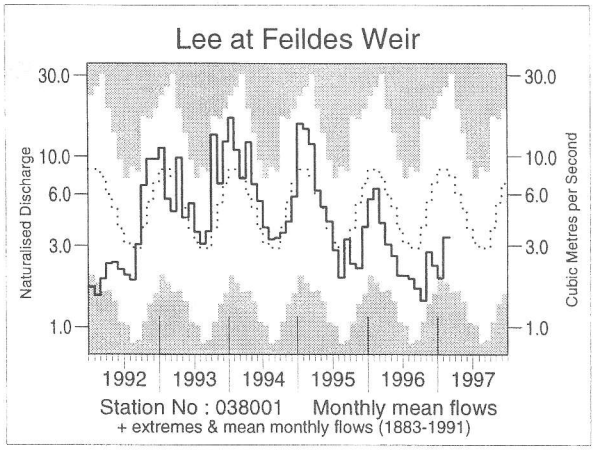


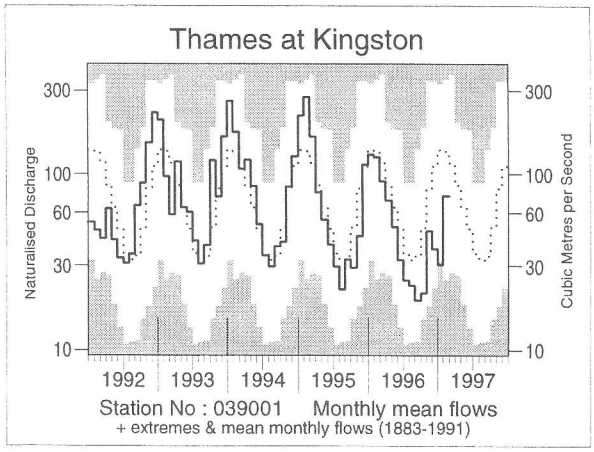


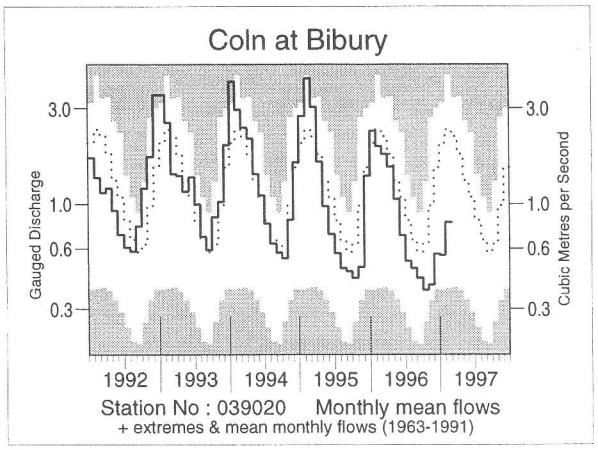


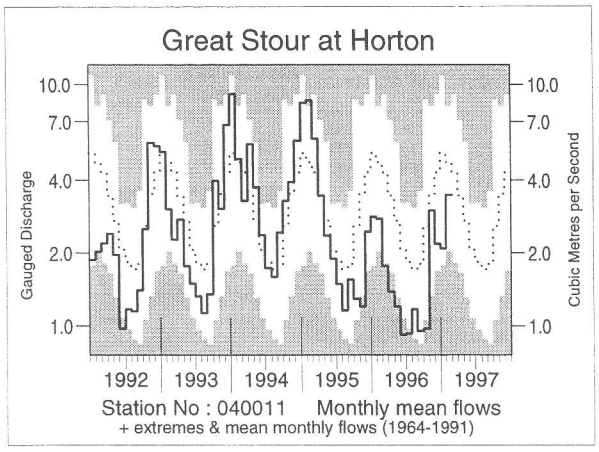


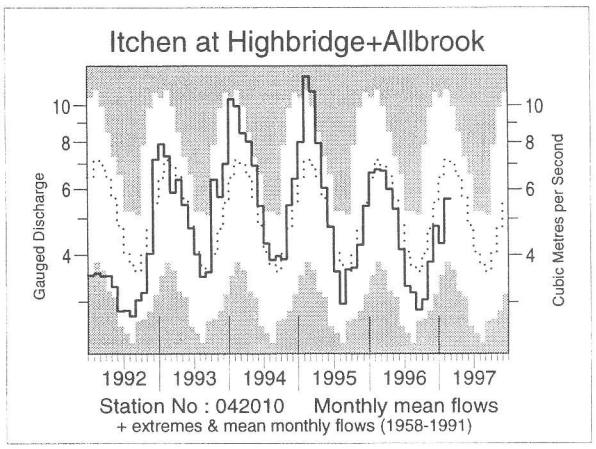


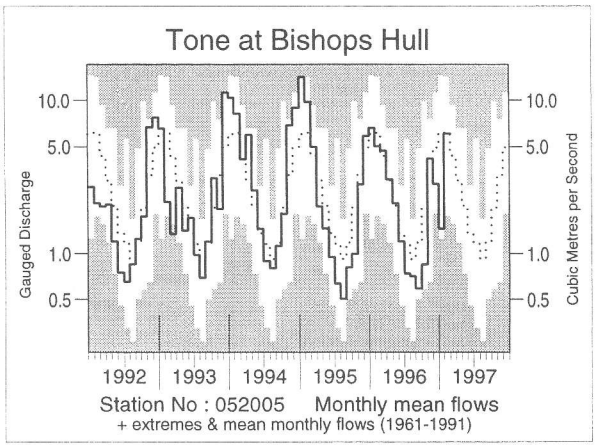


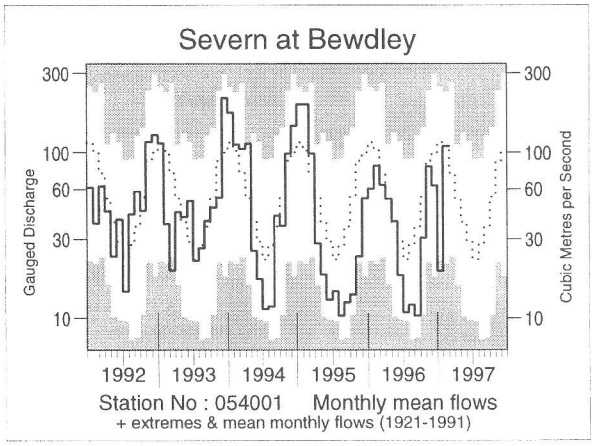


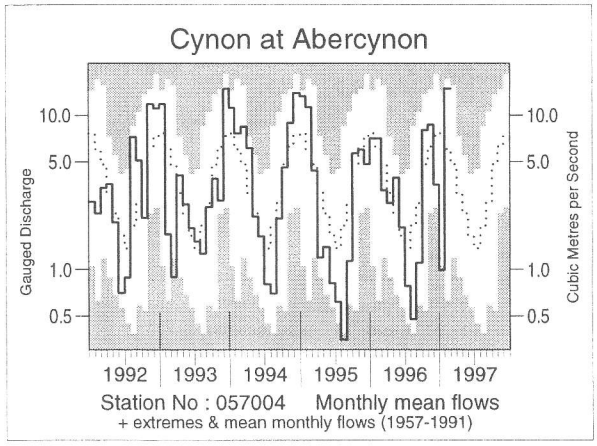

Coln at Bibury
Gauged Discharge
Cubic Metres per Second
3.0
1.0
0.6
0.3
1992
1993
1994
1995
1996
1997
Station No : 039020 Monthly mean flows
+ extremes & mean monthly flows (1963-1991)

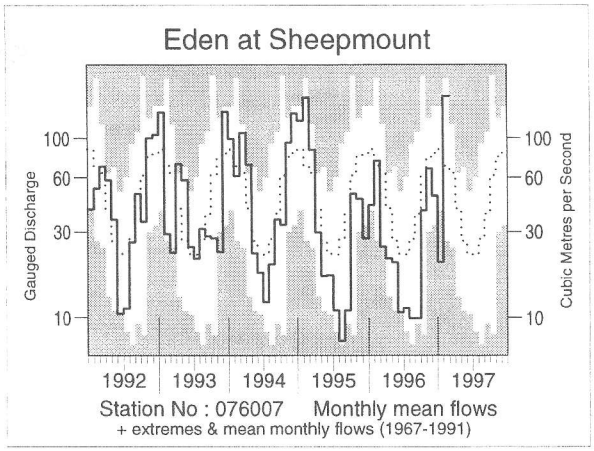

Great Stour at Horton
Gauged Discharge
Cubic Metres per Second
10.0
7.0
4.0
2.0
1.0
1992
1993
1994
1995
1996
1997
Station No : 040011 Monthly mean flows
+ extremes & mean monthly flows (1964-1991)


Itchen at Highbridge+Allbrook
Gauged Discharge
Cubic Metres per Second
10
8
6
4
1992
1993
1994
1995
1996
1997
Station No : 042010 Monthly mean flows
+ extremes & mean monthly flows (1958-1991)


Tone at Bishops Hull
Gauged Discharge
Cubic Metres per Second
10.0
5.0
1.0
0.5
1992
1993
1994
1995
1996
1997
Station No : 052005 Monthly mean flows
+ extremes & mean monthly flows (1961-1991)


Severn at Bewdley
Gauged Discharge
Cubic Metres per Second
300
100
60
30
10
1992
1993
1994
1995
1996
1997
Station No : 054001 Monthly mean flows
+ extremes & mean monthly flows (1921-1991)


Cynon at Abercynon
Gauged Discharge
Cubic Metres per Second
10.0
5.0
1.0
0.5
1992
1993
1994
1995
1996
1997
Station No : 057004 Monthly mean flows
+ extremes & mean monthly flows (1957-1991)


Eden at Sheepmount
Gauged Discharge
Cubic Metres per Second
100
60
30
10
1992
1993
1994
1995
1996
1997
Station No : 076007 Monthly mean flows
+ extremes & mean monthly flows (1967-1991)

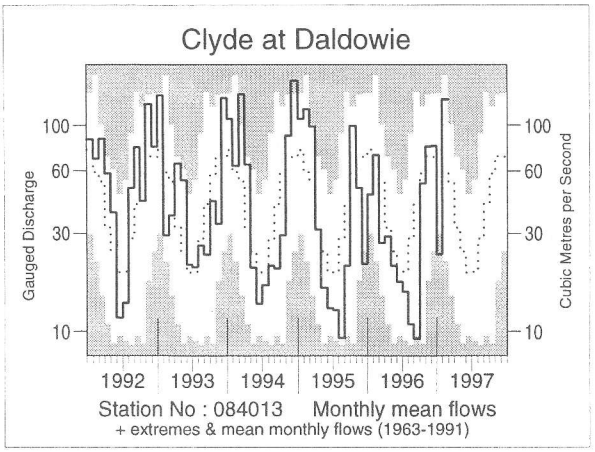

Clyde at Daldowie
Gauged Discharge
Cubic Metres per Second
100
60
30
10
1992
1993
1994
1995
1996
1997
Station No : 084013 Monthly mean flows
+ extremes & mean monthly flows (1963-1991)

TABLE 3 RUNOFF AS MM. AND AS A PERCENTAGE OF THE PERIOD OF RECORD AVERAGE WITH SELECTED PERIODS RANKED IN THE RECORD

River/ Station name	Oct 1996	Nov	Dec	Jan	Feb 1997		12/96 to 2/97		8/96 to 2/97		3/96 to 2/97		5/95 to 2/97	
	mm %LT	mm %LT	mm %LT	mm %LT	mm %LT	rank /yrs	mm %LT	rank/ yrs	mm %LT	rank /yrs	mm %LT	rank /yrs	mm %LT	rank /yrs
Dee at	58	63	77	39	97	19	213	6	360	2	641	3	1434	12
Park	70	82	91	42	132	/25	84	/25	73	/24	81	/24	101	/23
Tay at	118	139	105	54	202	42	360	16	656	13	986	10	1819	9
Ballathie	105	115	74	36	172	/45	88	/45	86	/44	87	/44	88	/43
Tweed at	67	103	126	42	183	36	351	30	545	18	710	12	1227	8
Boleside	93	118	127	39	233	/37	122	/36	103	/36	93	/36	89	/35
Whiteadder Water at	8	29	102	47	48	17	196	22	245	14	351	12	612	9
Hutton Castle	27	79	217	78	101	/28	126	/28	99	/27	91	/27	89	/26
South Tyne at	34	84	75	32	166	34	273	17	405	3	532	3	917	1
Haydon Bridge	50	91	72	31	219	/35	96	/35	75	/33	69	/33	65	/31
Wharfe at	39	79	77	28	138	38	243	16	401	7	499	4	708	1
Flint Mill Weir	64	102	79	27	181	/42	89	/42	81	/41	70	/41	55	/40
Derwent at	6	15	30	21	23	9	74	6	107	4	180	1	359	1
Buttercrambe	30	54	74	47	60	/36	60	/36	55	/35	57	/35	63	/34
Trent at	11	22	31	15	27	12	73	5	125	4	191	1	353	1
Colwick	46	71	69	29	64	/39	54	/39	56	/38	55	/38	56	/37
Lud at	4	8	17	16	13	7	45	8	67	6	110	2	213	2
Louth	35	53	83	53	38	/29	56	/29	52	/29	45	/28	50	/27
Witham at	4	6	9	9	11	8	28	6	44	5	85	2	161	2
Claypole Mill	37	47	43	34	40	/38	40	/38	41	/38	46	/37	50	/37
Little Ouse at	4	7	10	8	10	4	28	5	48	4	78	2	150	2
Abbey Heath	42	60	61	34	45	29	47	/29	50	/29	48	/28	51	/28
Colne at	3	7	7	5	5	3	17	3	33	4	55	1	118	3
Lexden	33	58	40	22	27	/38	30	/37	38	/36	41	/36	50	/34
Lee at	4	7	6	5	8	16	19	5	38	6	74	7	169	10
Feildes Weir (natr.)	36	51	33	23	39	/112	32	/112	39	/111	45	/110	58	/109
Thames at	6	12	10	8	18	24	37	9	66	8	138	8	302	13
Kingston (natr.)	42	57	33	22	55	/115	37	/114	43	/114	56	/114	69	/113
Coln at	9	10	14	14	18	2	46	2	88	2	226	1	467	3
Bibury	58	40	35	26	33	/34	32	/34	41	/33	58	/33	67	/32
Great Stour at	8	23	17	16	24	13	58	3	104	4	152	1	297	1
Horton	37	85	49	39	73	/33	54	/32	58	/32	53	/30	57	/29
Itchen at	23	28	36	32	38	10	105	8	200	6	387	6	736	9
Highbridge+Allbrook	75	81	85	66	77	/39	76	/39	78	/38	84	/38	89	/37
Stour at	8	33	30	18	49	12	96	5	151	5	274	4	556	2
Throop Mill	36	98	52	27	80	/25	53	/24	58	/24	70	/24	78	/23
Exe at	53	133	71	18	135	28	224	6	431	7	621	7	1111	1
Thorverton	72	135	52	13	129	/41	60	/41	71	/41	75	/40	73	/40
Taw at	28	134	62	14	118	29	195	6	367	6	502	5	859	1
Umberleigh	46	146	52	12	137	/39	61	/39	71	/38	73	/38	67	/37
Tone at	11	54	38	19	73	20	130	5	212	7	368	8	702	7
Bishops Hull	43	123	54	23	99	/37	58	/36	66	/36	77	/36	82	/35
Severn at	19	49	39	12	61	45	112	7	194	8	307	5	490	2
Bewdley	58	93	62	17	106	/76	59	/76	62	/76	68	/75	60	/75
Teme at	3	23	28	11	48	14	87	4	119	3	242	4	438	3
Knightsford Bridge	17	68	50	16	92	/27	50	/27	49	/27	67	/26	68	/26
Cynon at	203	211	90	25	340	38	455	16	908	16	1220	17	2083	8
Abercynon	170	135	46	13	246	/39	86	/39	96	/37	96	/37	89	/35
Dee at	255	282	94	25	364	28	483	5	1129	9	1453	6	2271	1
New Inn	138	121	37	10	217	/28	73	/28	87	/28	82	/27	69	/26
Eden at	46	77	56	24	181	29	261	15	407	6	509	4	855	1
Sheepmount	68	88	56	23	238	/30	94	/30	81	/29	73	/29	67	/28
Clyde at	74	107	112	33	171	33	316	20	524	13	676	9	1174	5
Daldowie	91	111	107	29	220	/34	107	/34	92	/33	86	/33	81	/32
Carron at	371	362	162	164	373	16	698	6	1627	7	2047	4	3276	1
New Kelso	148	130	49	50	167	/19	80	/18	90	/18	81	/18	71	/17
Ewe at	272	314	167	127	335	24	629	12	1337	8	1813	7	3025	3
Poolewe	124	121	61	46	173	/27	87	/27	89	/26	86	/26	77	/25

Notes:
(i) Values based on gauged flow data unless flagged (natr.), when naturalised data have been used.
(ii) Values are ranked so that lowest runoff is rank 1.
(iii) %LT means percentage of long term average from the start of the record to 1995. For the long periods (at the right of this table), the end date for the long term is 1997.

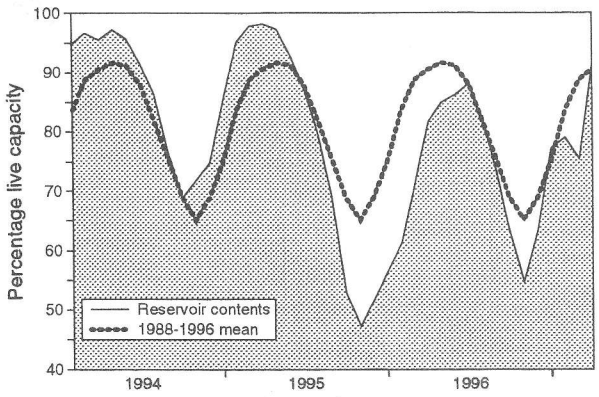
TABLE 4 START-MONTH RESERVOIR STORAGES UP TO MARCH 1997

Area	Reservoir (R)/ Group (G)		Capacity● (Ml)	1996 Oct	Nov	Dec	1997 Jan	Feb	Mar	*1996 Mar*
North West	N.Command Zone[1]	(G)	133375	36	69	84	77	66	100	*78*
	Vyrnwy	(R)	55146	35	65	86	81	71	100	*59*
Northumbria	Teesdale[2]	(G)	87936	34	35	61	78	80	95	*72*
	Kielder	(R)	199175*	81	86	93	88	89	100	*95*
Severn-Trent	Clywedog	(R)	44922	46	66	80	81	76	93	*77*
	Derwent Valley[3]	(G)	39525	27	30	93	98	94	100	*46*
Yorkshire	Washburn[4]	(G)	22035	62	64	86	97	86	98	*53*
	Bradford supply[5]	(G)	41407	48	59	84	90	88	100	*53*
Anglian	Grafham	(R)	58707	71	67	68	69	68	72	*94*
	Rutland	(R)	130061	72	70	70	71	68	73	*82*
Thames	London[6]	(G)	206399	54	46	59	70	70	85	*94*
	Farmoor [7]	(G)	13843	91	92	100	99	93	96	*96*
Southern	Bewl	(R)	28170	58	52	59	60	65	85	*96*
	Ardingly	(R)	4685	37	33	55	64	68	100	*100*
Wessex	Clatworthy	(R)	5364	48	44	88	96	81	100	*100*
	Bristol W [8]	(G)	38666*	57	59	77	80	74	96	*86*
South West	Colliford	(R)	28540	43	42	50	53	52	57	*61*
	Roadford[9]	(R)	34500	38	40	51	54	52	61	*35*
	Wimbleball[10]	(R)	21320	43	42	60	64	59	81	*72*
	Stithians	(R)	5205	57	50	71	88	90	96	*100*
Welsh	Celyn + Brenig	(G)	131155	48	63	75	82	78	97	*69*
	Brianne	(R)	62140	63	87	100	93	84	99	*100*
	Big Five[11]	(G)	69762	46	64	77	75	67	96	*94*
	Elan Valley[12]	(G)	99106	57	82	99	92	85	100	*95*
East of Scotland	Edin./Mid Lothian[13]	(G)	97639	68	74	89	93	91	100	*100*
	East Lothian[14]	(G)	10206	67	63	79	100	100	100	*100*
West of Scotland	Loch Katrine	(G)	111363	56	90	97	89	85	100	*96*
	Daer	(R)	22412	53	89	100	98	91	100	*100*
	Loch Thom	(G)	11840	59	88	100	99	96	100	*98*

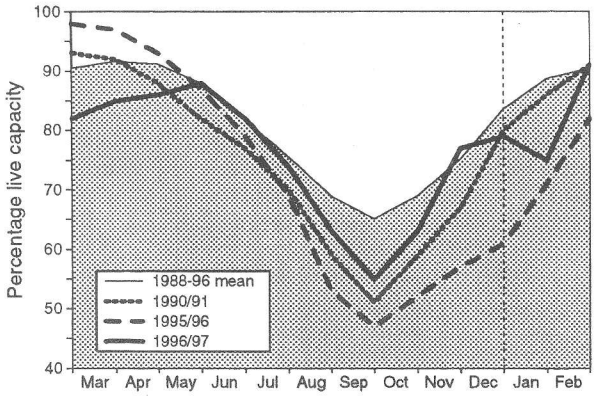
● Live or usable capacity (unless indicated otherwise) * Gross storage/percentage of gross storage

1. Includes Haweswater, Thirlmere, Stocks and Barnacre.
2. Cow Green, Selset, Grassholme, Balderhead, Blackton and Hury.
3. Howden, Derwent and Ladybower.
4. Swinsty, Fewston, Thruscross and Eccup.
5. The Nidd/Barden group (Scar House, Angram, Upper Barden,Lower Barden and Chelker) plus Grimwith.
6. Lower Thames (includes Queen Mother, Wraysbury, Queen Mary, King George VI and Queen Elizabeth II) and Lee Valley (includes King George and William Girling) groups -pumped storages.
7. Farmoor 1 and 2 - pumped storages.
8. Blagdon, Chew Valley and others.
9. Roadford began filling in November 1989.
10. Shared between South West (river regulation for abstraction) and Wessex (direct supply).
11. Usk, Talybont, Llandegfedd (pumped stroage), Taf Fechan, Taf Fawr.
12. Claerwen, Caban Coch, Pen-y-garreg and Craig Goch.
13. Megget, Talla, Fruid, Gladhouse, Torduff, Clubbiedean, Glencorse,Loganlea and Morton (upper and lower).
14. Thorters, Donolly, Stobshiel, Lammerloch, Hopes and Whiteadder

A GUIDE TO THE VARIATION IN OVERALL RESERVOIR STOCKS FOR ENGLAND AND WALES



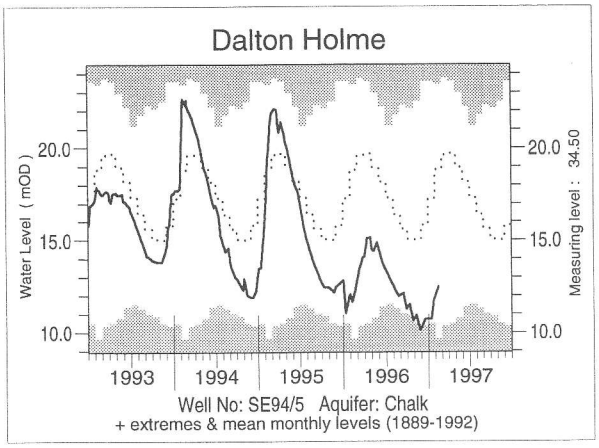
A COMPARISON BETWEEN OVERALL RESERVOIR STOCKS FOR ENGLAND AND WALES IN RECENT YEARS

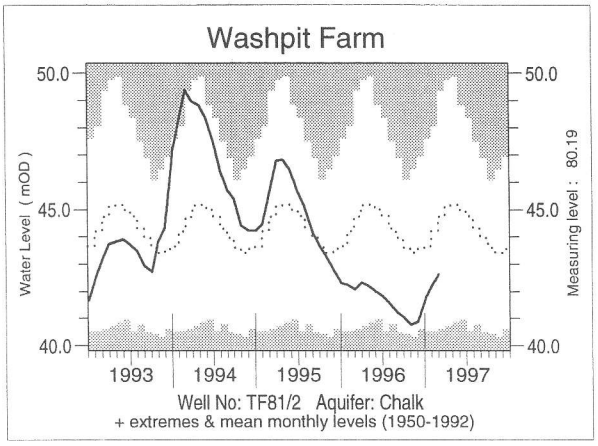


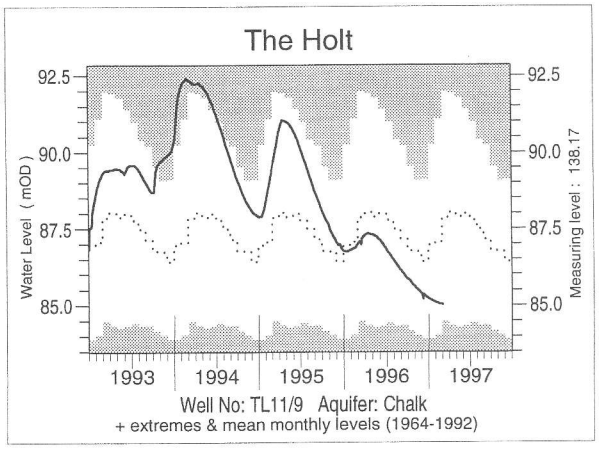
These plots are based on the reservoirs featured in Table 4 only

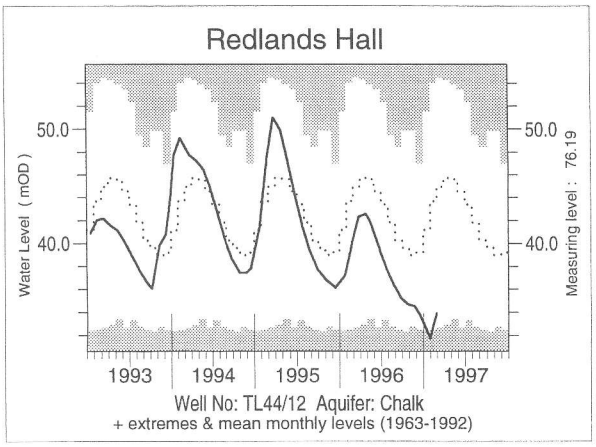
Note: Variations in storage depend on the balance between inputs (from catchment rainfall and any pumping) and outputs (to supply, compensation flow, HEP, amenity). There will be additional losses due to evaporation, especially in the summer months. Operational strategies for making the most efficient use of water stocks will further affect reservoir storages. Table 4 is intended to provide a link between the hydrological conditions described elsewhere in the report and the water resources situation. The reservoirs featured may not be representative of storage conditions across the individual regions; this can be particularly important during drought conditions (eg, in the Severn-Trent region during 1995/96).

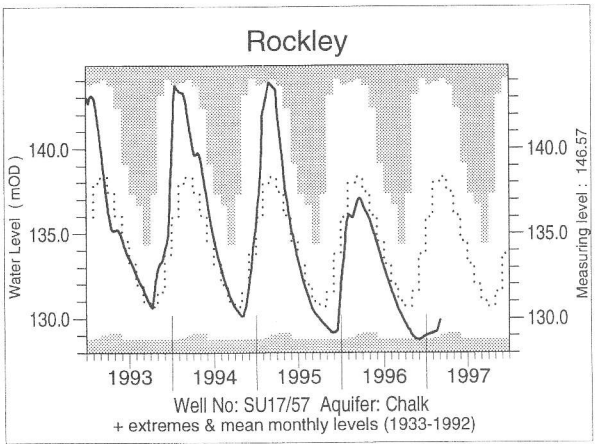
FIGURE 2 GROUNDWATER LEVEL HYDROGRAPHS

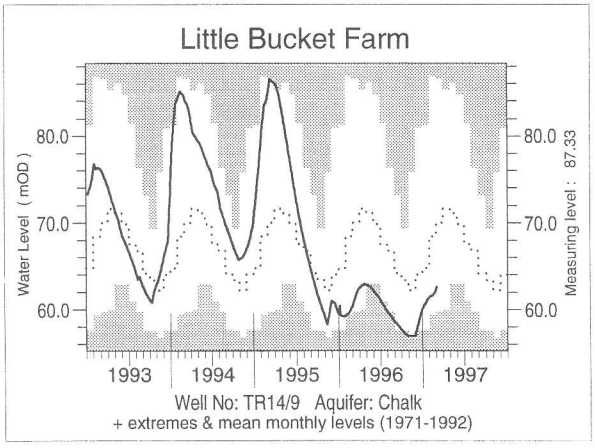


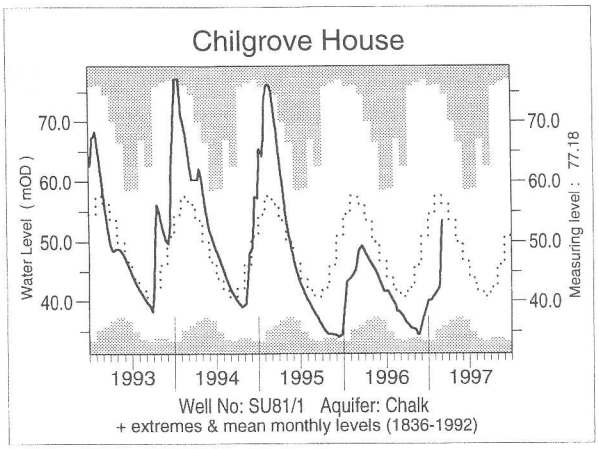


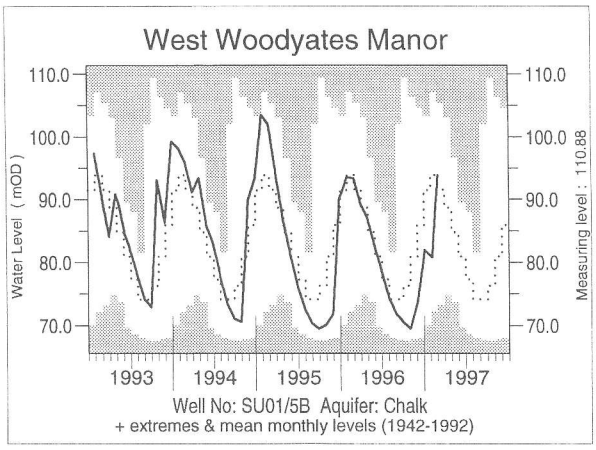




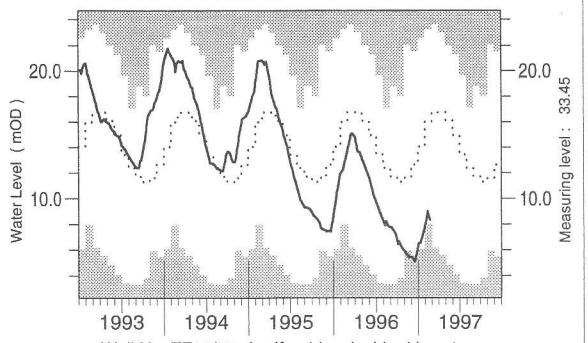






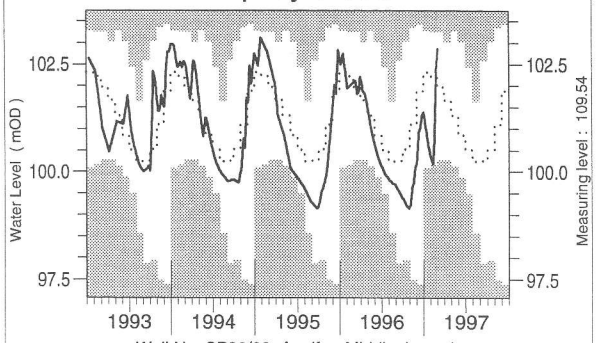


New Red Lion



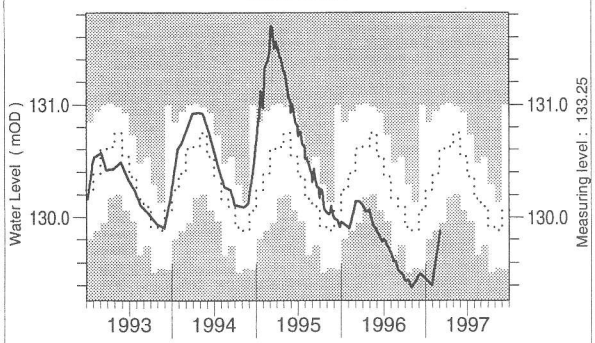
Well No: TF03/37 Aquifer: Lincolnshire Limestone
+ extremes & mean monthly levels (1964-1992)

Ampney Crucis



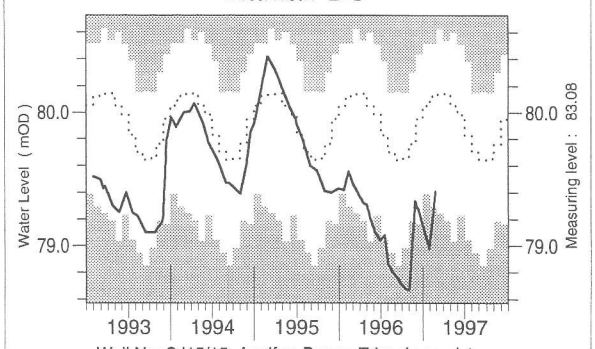
Well No: SP00/62 Aquifer: Middle Jurassic
+ extremes & mean monthly levels (1958-1992)

Skirwith



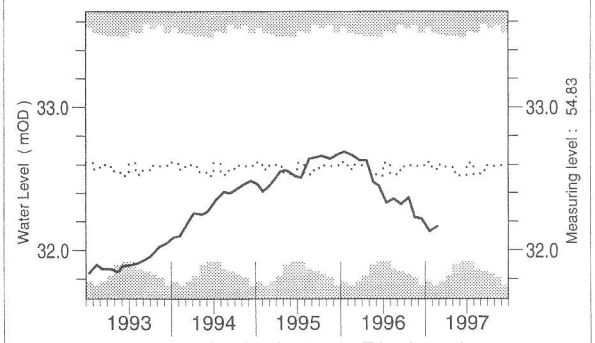
Well No: NY63/2 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1978-1992)

Llanfair DC



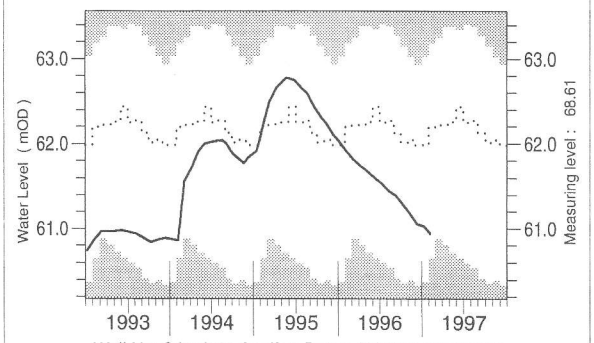
Well No: SJ15/15 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1972-1992)

Morris Dancers



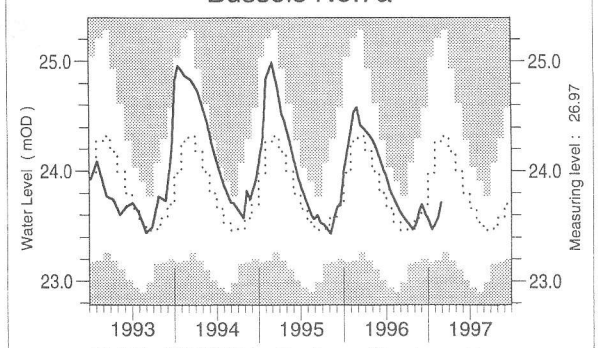
Well No: SK67/17 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1969-1992)

Heathlanes



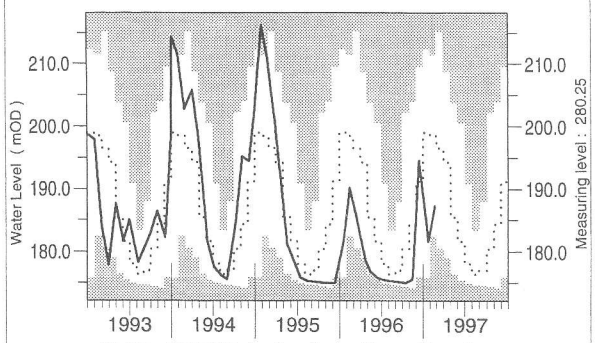
Well No: SJ62/112 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1971-1992)

Bussels No.7a



Well No: SX99/37B Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1971-1992)

Alstonfield



Well No: SK15/16 Aquifer: Carboniferous Limestone
+ extremes & mean monthly levels (1974-1992)

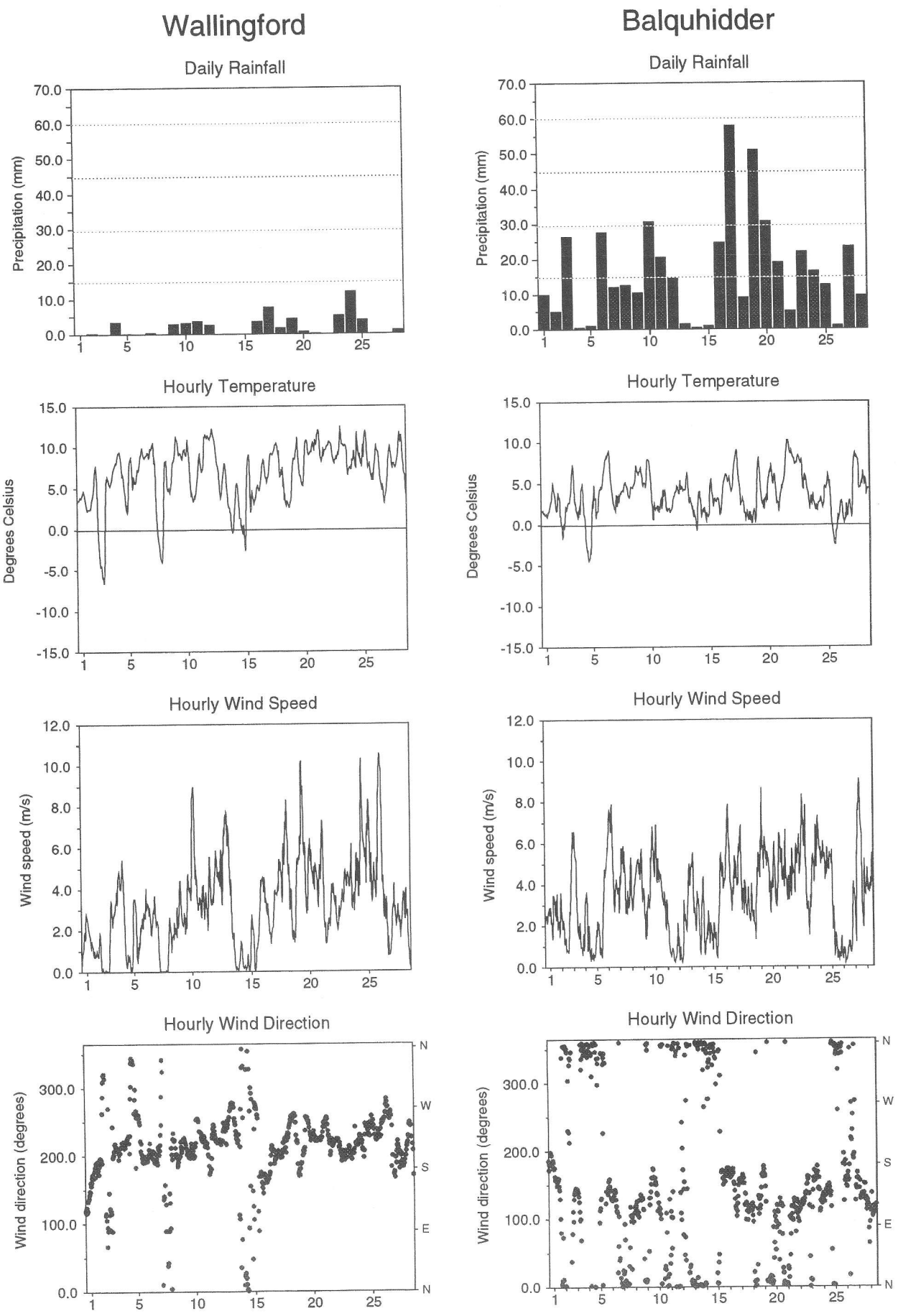
TABLE 5 FEBRUARY GROUNDWATER LEVELS 1997

Site	Aquifer	Records Commence	Minimum Feb <1997	Average Feb <1997	Maximum Feb <1997	No of years Feb/Apr level < 1996	Feb/Apr 1996 day	Feb/Apr 1996 level
Dalton Holme	Ck	1889	9.64	18.67	23.44	5	13/02	12.50
Wetwang	Ck	1971	16.66	25.00	34.31	4	13/02	20.18
Keelby Grange	Ck	1980	3.87	11.84	19.70	2	24/02	5.50
Washpit Farm	Ck	1950	40.51	44.18	48.20	>10	03/03	42.62
The Holt	Ck	1964	84.03	87.32	92.41	2	03/03	85.02
Therfield Rectory	Ck	1883	70.72	78.17	96.17	>10	10/02	72.52
Redlands Hall	Ck	1963	32.47	43.05	54.01	2	26/02	33.84
Rockley	Ck	1933	128.92	138.09	143.90	3	03/03	129.90
Little Bucket Farm	Ck	1971	59.34	69.01	86.87	8	04/03	62.66
Compton House	Ck	1894	29.60	48.17	66.10	4	19/02	31.73
Chilgrove House	Ck	1836	35.36	57.41	76.20	>10	03/03	53.45
Westdean No 3	Ck	1940	1.19	2.30	5.03	10	28/02	1.68
Lime Kiln Way	Ck	1969	124.12	125.32	126.34	>10	19/02	125.33
Ashton Farm	Ck	1974	64.84	69.64	71.18	6	03/03	69.43
West Woodyates	Ck	1942	72.22	93.05	107.10	>10	03/03	93.93
Killyglen (NI)	Ck	1985	113.59	115.83	119.50	9	28/02	116.53
New Red Lion	LLst	1964	7.97	15.92	23.29	1	20/02	8.32
Ampney Crucis	Mid J	1958	100.17	102.23	103.27	>10	03/03	102.86
Redbank	PTS	1981	7.60	8.44	9.08	4	27/02	8.16
Yew Tree Farm	PTS	1972	12.69	13.59	13.95	3	04/03	13.49
Skirwith	PTS	1978	129.88	130.53	131.39	0	01/03	129.88
Llanfair DC	PTS	1972	79.29	79.98	80.52	1	24/02	79.41
Morris Dancers	PTS	1969	31.75	32.49	33.52	9	24/02	32.17
Heathlanes	PTS	1971	60.65	61.95	63.19	3	05/02	60.94
Bussels No 7A	PTS	1971	23.19	24.28	25.21	4	26/02	23.72
Rusheyford NE	MgLst	1967	65.32	72.79	76.84	>10	24/02	76.23
Peggy Ellerton	MgLst	1968	31.73	34.38	36.84	2	24/02	32.25
Alstonfield	CLst	1974	182.47	198.89	216.18	3	21/02	187.26

groundwater levels are in metres above Ordnance Datum

Ck	Chalk	MidJ	Middle Jurassic Limestones
LLst	Linconshire Limestone	MgLst	Magnesian Limestone
PTS	Permo-Triassic sandstones	Clst	Carboniferous Limestones

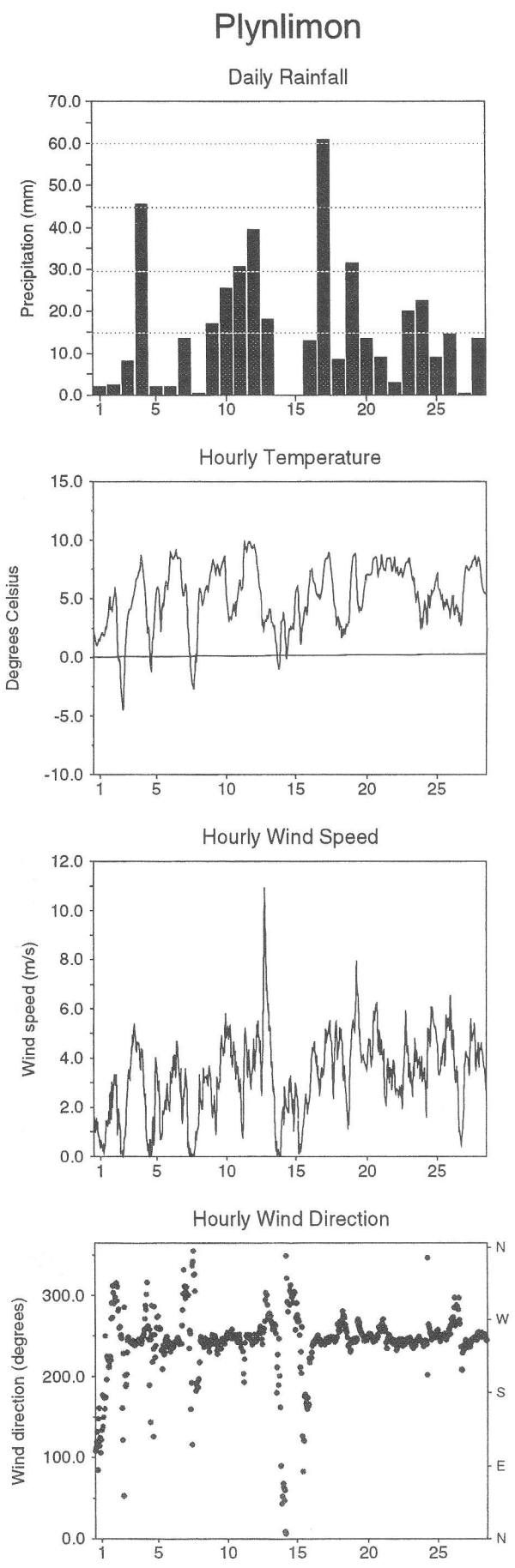
FIGURE 3 METEOROLOGICAL SUMMARY - FEBRUARY 1997



The Institute of Hydrology Meteorological Station occupies a relatively open site on the Thames floodplain about 5km NW of the Chilterns escarpment. Station elevation is 48m

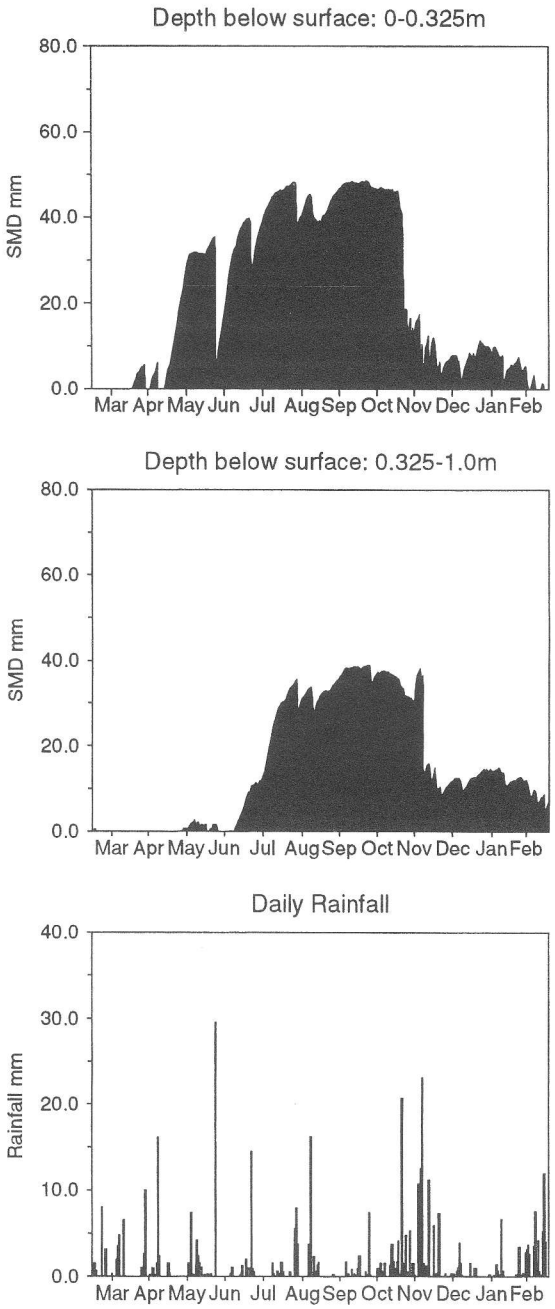
The Lower Kirkton automatic weather station (Balquhidder) occupies a relatively sheltered position at the mouth of the SSE trending Kirkton Glen. Station elevation is 270m aOD and average annual rainfall exceeds 2000mm; snow cover is expected for 10-30 days a year.

FIGURE 3 (continued)



The Dolydd automatic weather station at Plynlimon is sited in an exposed field with a forested area to the south. Surrounding land reaches a peak height of around 400m. Station elevation is 300m aOD and average annual rainfall exceeds 2300mm.

FIGURE 3a. WALLINGFORD SMD DATA 1996/7.



Note

Soil moisture deficit is defined as the amount by which the water stored in the soil is below the quantity held at field capacity. Two automatic soil water stations (ASWSs) deployed at Wallingford, which use capacitance soil water sensors installed at depths of 5,15 and 50 cm, are the sources of the data. Figure 3a shows deficits calculated from one of the stations for the depth ranges 0-0.325m (15cm probe) and 0.325-1.0m (50cm probe) at 0100 GMT on each day. At the end of January 1996, field capacity was re-estimated using recent data and the soil moisture deficit values for the previous months were recalculated accordingly.

Daily rainfall from the Wallingford met station from March 1996 is presented.

FIGURE 4 LOCATION MAP OF GAUGING STATIONS AND GROUNDWATER INDEX WELLS